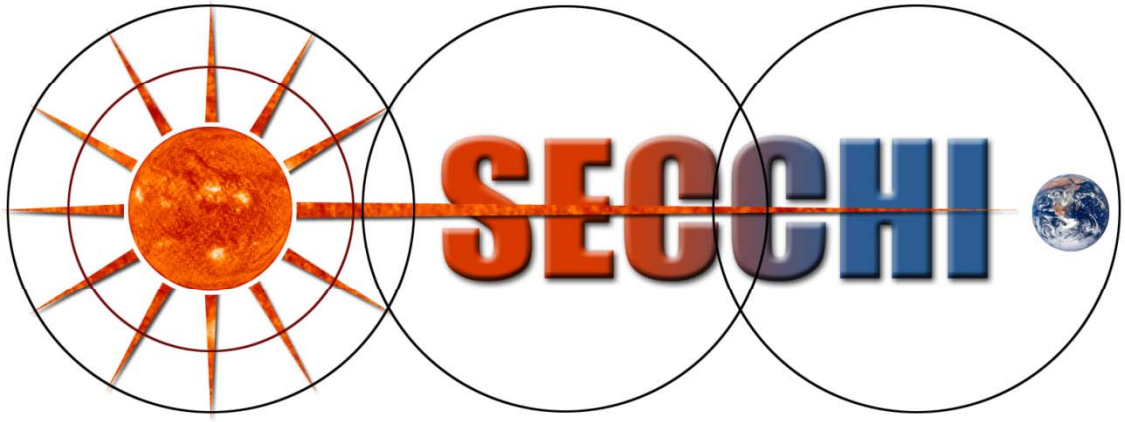
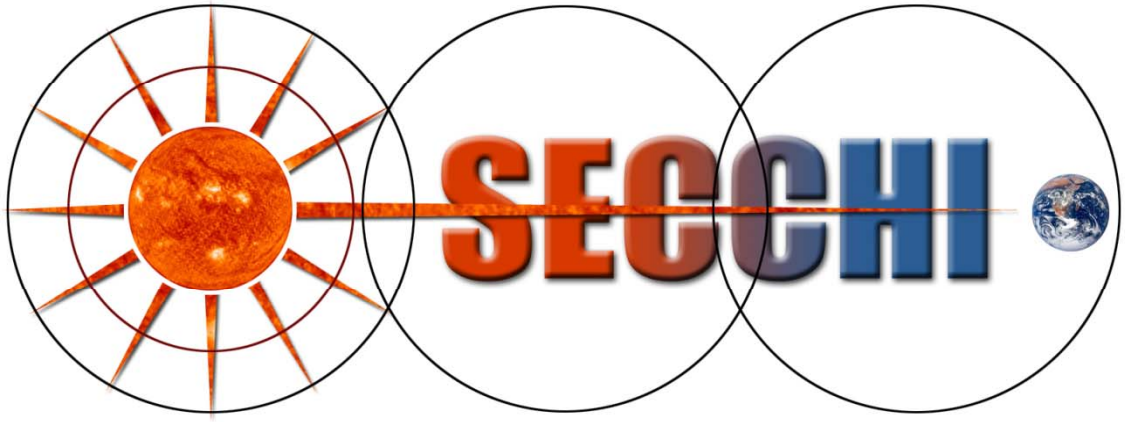


SECCHI Status Report 2014

Angelos Vourlidas
SECCHI Project Scientist



SECCHI Operations Update
18 March 2014

Nathan Rich
SECCHI Operations Lead

SECCHI Calibrations 3/1/12 – 3/1/14

- **2012/04/17 – COR1/2 Door Open Calibrations (same as mom. dump)**
- **2013/12/12 – COR1-A and EUVI-A Mercury transit observations**
- **2013/12/26 – COR2-A Rice compression to evaluate Icer effect on stars**

Description	A	B
Calibration Rolls	**7**	**6**
COR1/2 closed door cals (momentum dump)	**21**	**22**
Mechanism spin-timer tests	**11**	**21**
HI LED Calibration sequences	**10**	**5**
HI Linearity Calibration sequences	**5**	**10**

SECCHI Notable Events 3/1/12 – 3/1/14

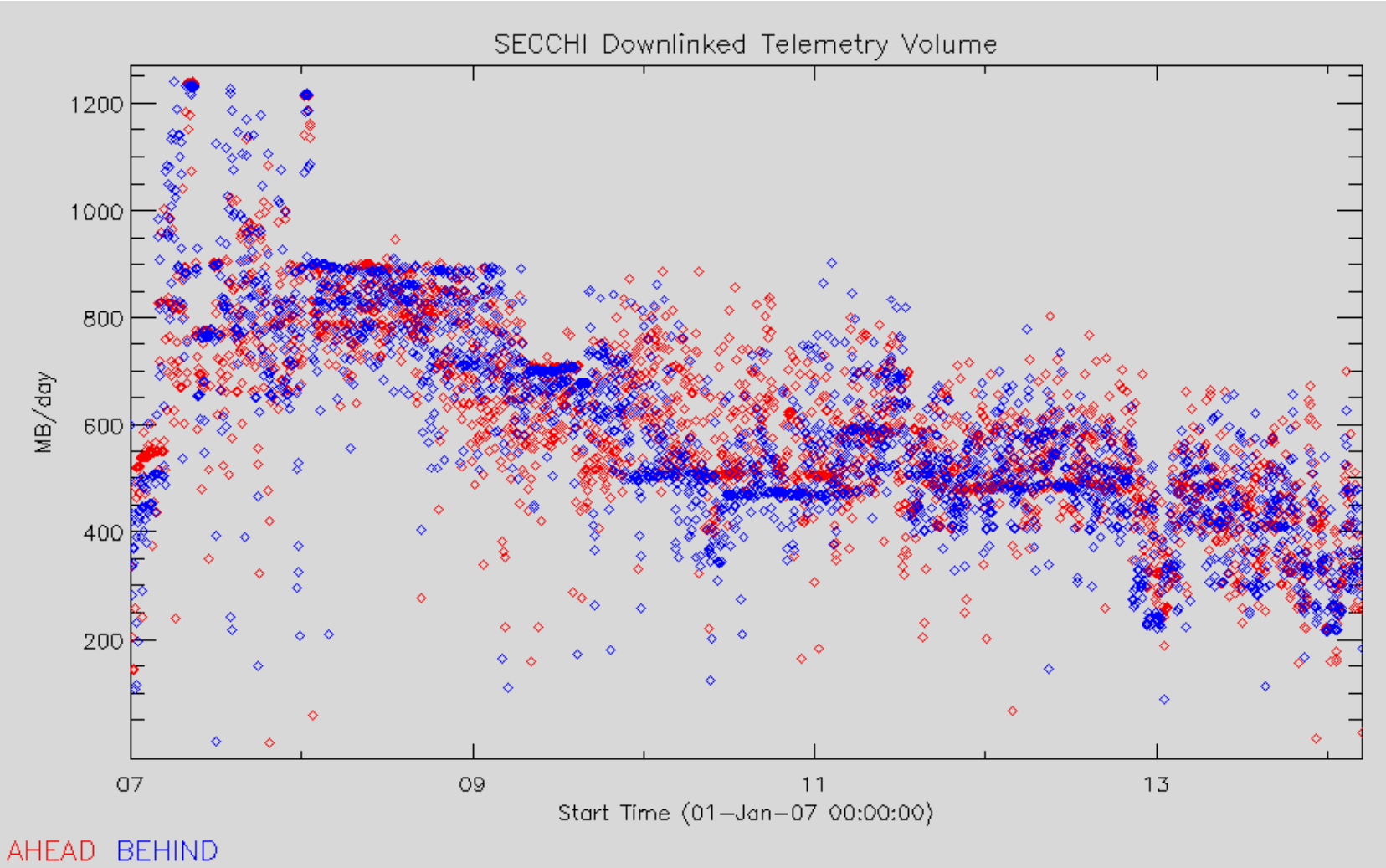
- **Switched to 120kbps nominal downlink: Ahead 2013/05/04, Behind 2012/11/05**
  - **Periods of low average telemetry and gaps in coverage have increased.**
- **2013/10/10 – 12/11: Special observations for Comet ISON on Ahead and Behind**
  - **Coordinated with NASA Comet ISON Observing Campaign**
  - **Use of offline DSN resources on "contingency" (not-guaranteed) basis was successful.**

Onboard CME Detection

Detection of CME in COR2 controlled by schedule of type DOUBLE exposures (30 min. cadence) and settings in threshold tables.

For year ending	Adet	Bdet	Acap	Bcap
2007/12/31	**4**	**4**	**0**	**0**
2008/12/31	**4**	**1**	**0**	**0**
2009/12/31	**0**	**0**	**0**	**0**
2010/12/31	**10**	**0**	**10**	**0**
2011/12/31	**89**	**38**	**54**	**29**
2012/12/31	**133**	**75**	**69**	**48**
2013/12/31	**102**	**57**	**50**	**39**
Total thru 2014/03/16	**380**	**190**	**199**	**125**

SECCHI Telemetry Volume



SECCHI Image Statistics

- **Totals by telescope, 2013/03/01-2014/02/28:**

	Cor1A	Cor1B	Cor2A	Cor2B	EuviA	EuviB	Hi1A	Hi1B	Hi2A	Hi2B
N Images (not incl. SPWX)	280868	275054	57993	58436	188334	190368	12917	12485	4542	4432
Size (Raw GB)	27.4	27.0	15.5	14.4	48.1	47.9	20.5	20.0	9.7	9.0
Size (FITS GB)	145	142	257	247	1495	1509	51.1	50.1	19.0	18.6

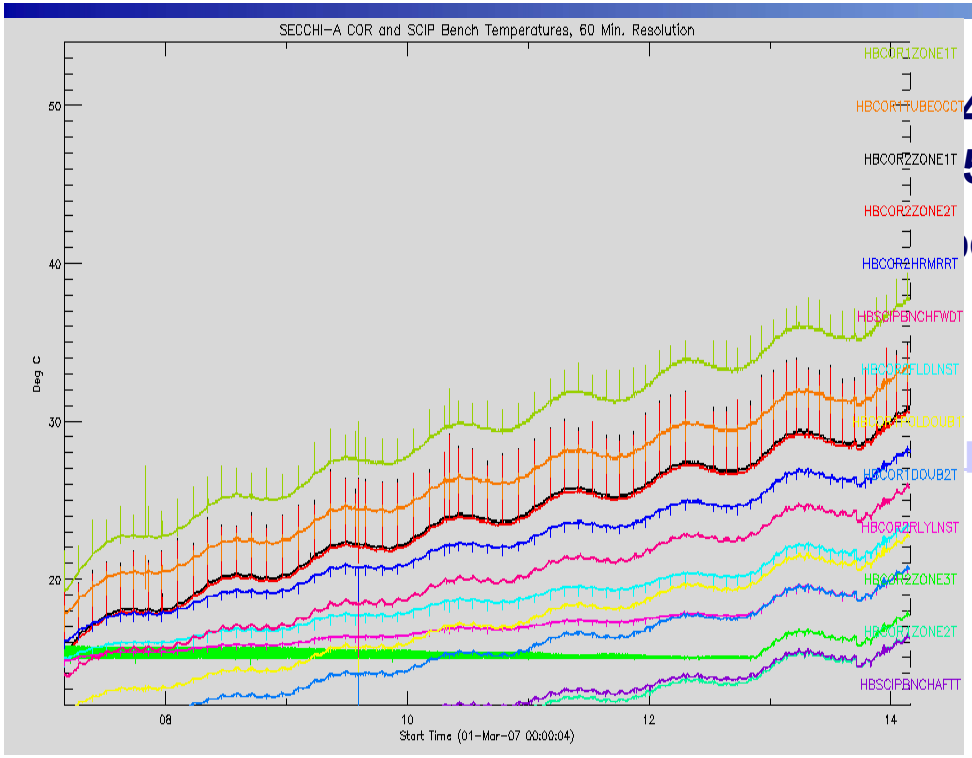
- **For specific information about SECCHI telemetry statistics, use `IDL> sccgetinfo` in SolarSoft**

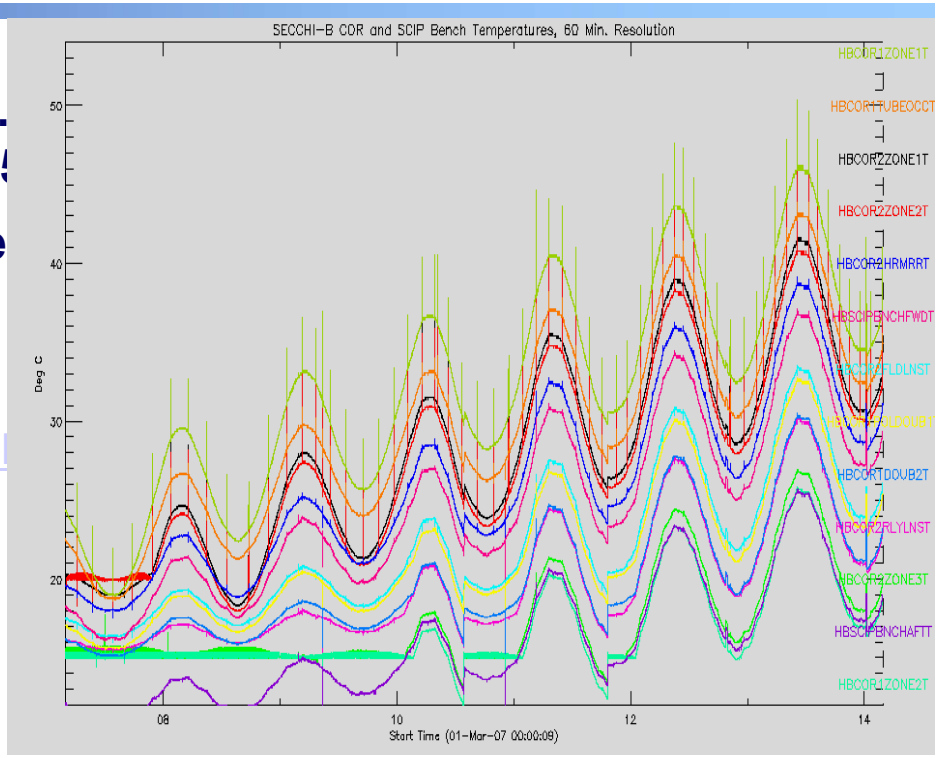
Processor Resets

- **SECCHI Electronics Box**
  - **Watchdog Resets: "Random" resets of the 750 CPU of unknown origin, continue at approximately the same rate.**

For year	A	B
2007	**5**	**4**
2008	**2**	**2**
2009	**8**	**5**
2010	**5**	**3**
2011	**5**	**1**
2012	**3**	**3**
2013	**4**	**2**
Total thru 2013/12/31	**32**	**20**
Remainder thru 2014/03/16	***1***	***0***

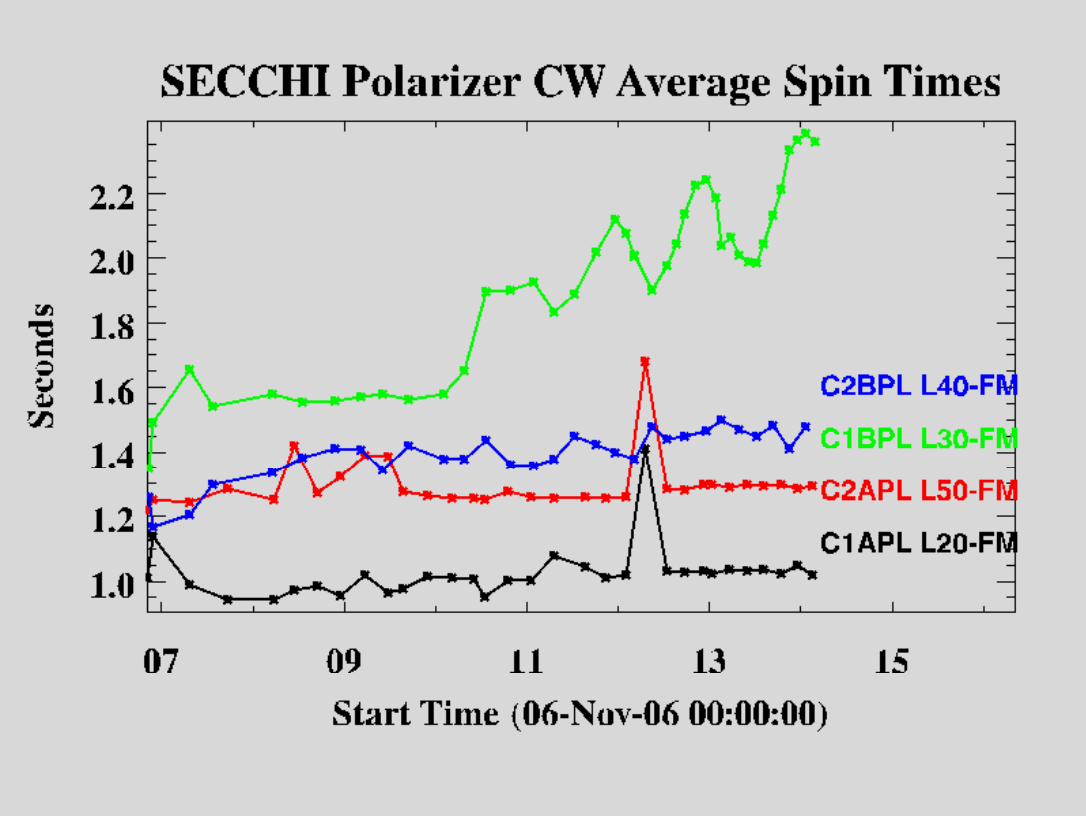
Temperature Trends





SECCHI Mechanisms

- COR1-B Polarizer spin time shows unusual increase.
- EUVI-A Quadrant Selector position errors (Oct. 2011, June 2012, Aug. 2013, Nov. 2013) fixed by updating Delay setting (90 to 70).
- COR1-B Polarizer position errors (mostly) fixed by adjusting Delay setting (130 to 160)

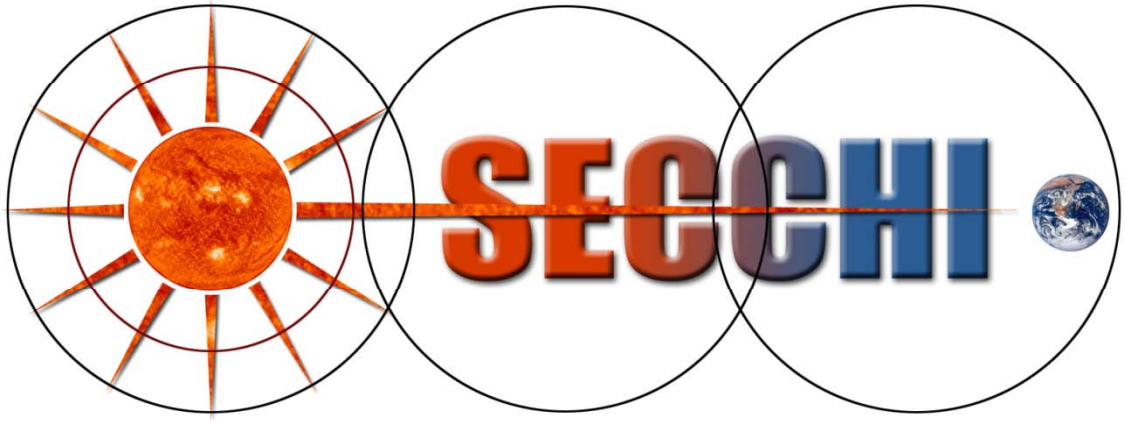


FSW Updates

- **FSW modified 1 time since Mar 1, 2012.**
  - **Spin timer scripts c1plccw0.cpp,v 1.3 and c2plccw0.cpp,v 1.2 (2012/04/03) updated to correctly report CCW readings.**
- **Table updates in unprotek between Mar 1, 2012 and Mar 1, 2014:**
  - **Image processing table 1 update (A only): imagetbl.img,v 1.149 (2012/04/03)**
  - **Exposure table 1 update: expostba.img,v 1.34 (2012/04/03)**
  - **Event-detect threshold table 1 update: thresha.img,v 1.47 (2012/04/03)**
  - **Autonomy rule table safettdb.img,v 1.15 (2013/05/16): Increased COR2 zones and SCIP CEB enclosure upper temperature limit to 55 deg to prevent potential trip during momentum dump.**
  - **Mechanism settings table motortba.img,v 1.11 (2012/04/03): Changed EUVI QS delay setting from90 to 70.**
  - **Light travel time offset table lighttbb.cpp 2 updates (v 1.14 on 2012/04/03 and v 1.17 on 2013/06/03): Annual update required.**
  - **Temporary mask, exposure, and image processing tables created for Comet ISON observations (2013/10-12) and Mercury transit on Ahead (2013/12/11)**

Programmatic - Other

- **Solarsoft Additions:**
  - **Find asteroids in HI FOV (check_for_asteroids.pro)**
  - **Further automate generation of browse images and synoptic maps**
  - **Further improvements in movie and measurement tools to accommodate HI pointing information**
  - **Improved incorporation of LASCO and other instruments in movie tools**
  - **Play movie from beacon images over the web from SSC**
  - **See**
    - http://sohowww.nascom.nasa.gov/solarsoft/stereo/secchi/doc/secchimvi.htm

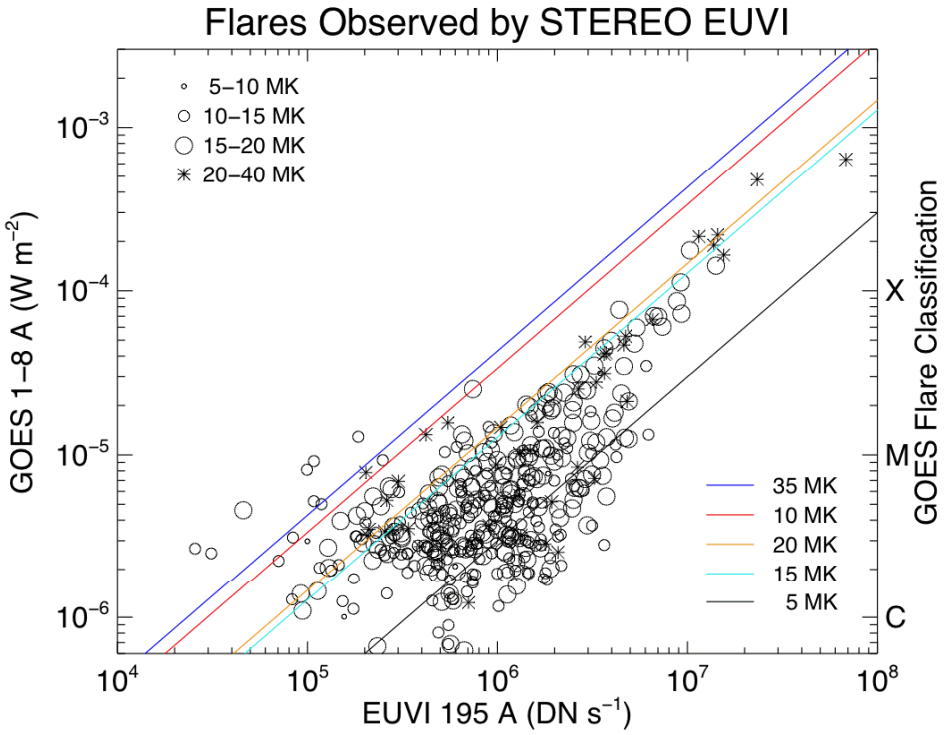


EUVI Status

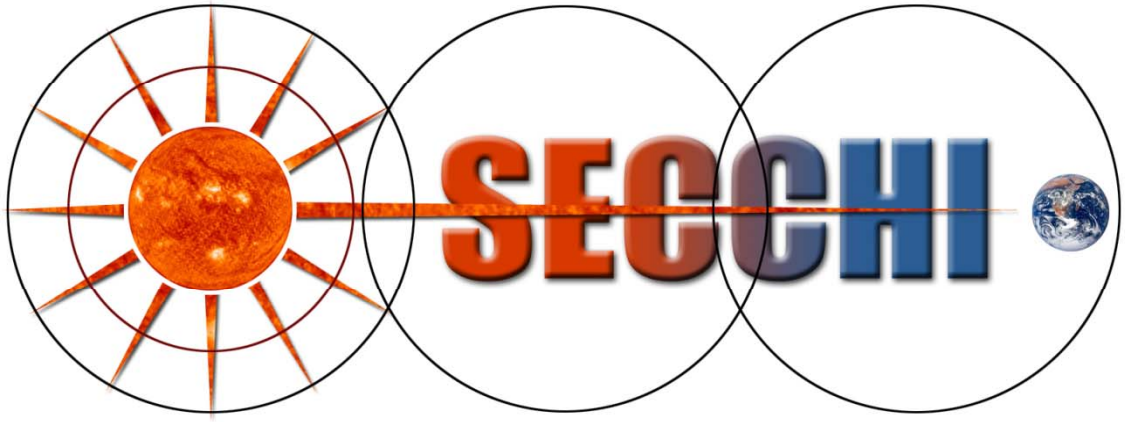
Nariaki Nitta

Status

- **The two EUVI telescopes continue to operate very well.**
- **A new pointing drift correction was implemented in the software.**
- **The EUVI flux was compared with the GOES XRS 1−8 Å flux to estimate the X-ray flux of flares on the backside.**
- **EUVI data were extensively used for studies of EUV waves. In combination with SDO/AIA data they provided the 3D geometry and trajectory of the waves.**
- **High-time-resolution (75s) images in 171 Å from CME trigger turned out to be very useful to determine single or multiple CMEs in big events.**
- **A number of papers came out on SEP events that made use of the 360° view of the corona by EUVI and AIA.**



Correlation between GOES 1−8 Å and EUVI 195 Å fluxes of flares without occultation. This is used to infer the X-ray intensity of flares on the far side (Nitta et al. 2013)



COR1 Status

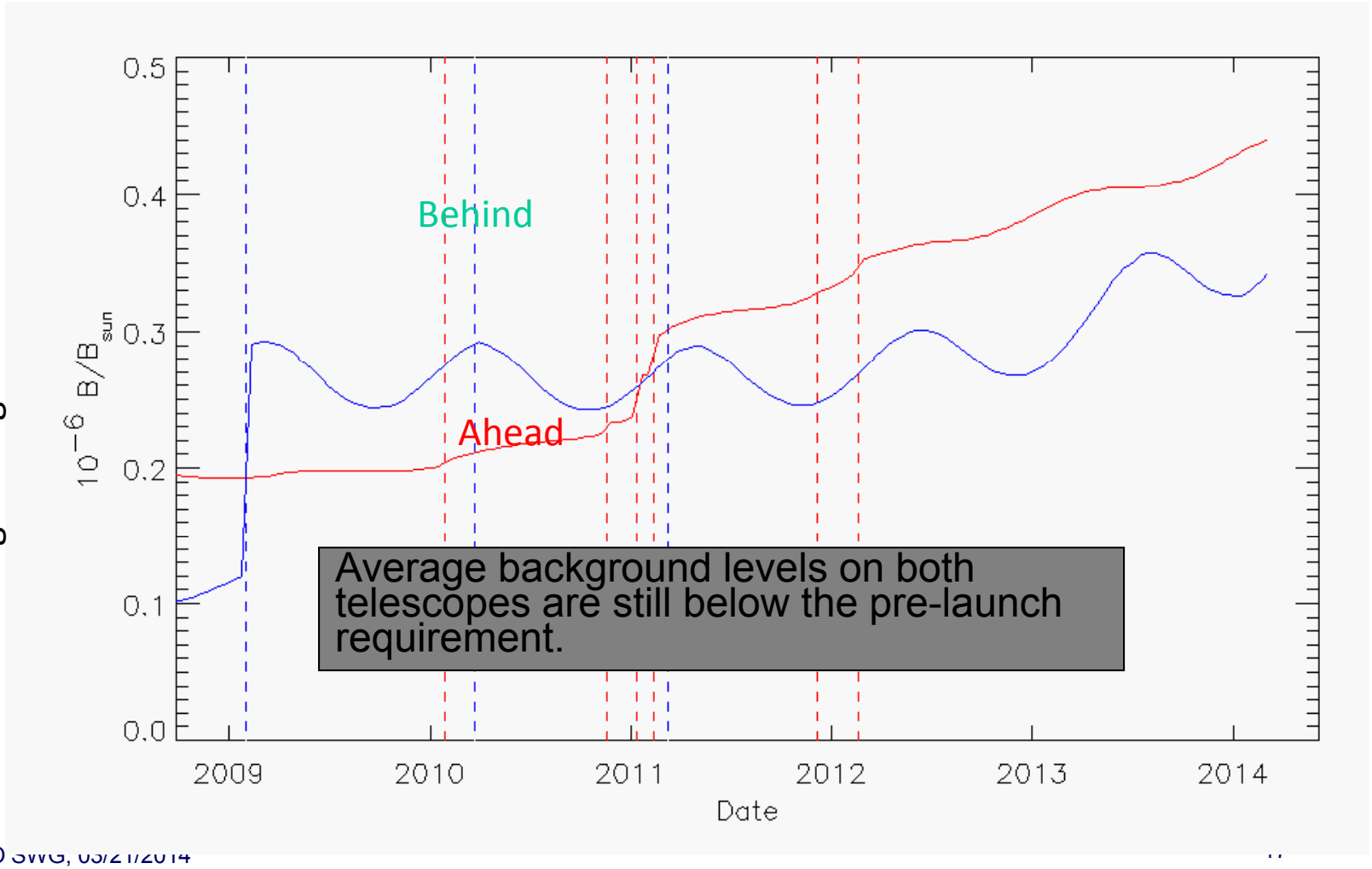
Bill Thompson

COR1 Operations

- ***Standard observing mode is to expose at 3 polarizer angles (0°, 120°, 240°) from which B and/or pB can be derived.***
- ***Depending on the amount of telemetry available, either:***
  - ***All three images are sent to the ground, or***
  - ***The images are summed onboard to form a single B image.***
  - ***If the latter, then generally alternate between the two forms.***
- ***Normal cadence is 5 minutes.***
- ***Images are binned to 512 ×512 resolution.***
- ***COR1-B exposure time is 1.7 seconds.***
- ***COR1-A exposure time is 1.0 seconds, due to increased instrumental background.***
  - ***Small overexposed area near lower edge of occulter.***
  - ***Exposure time may need to be reduced further if overexposed area increases.***

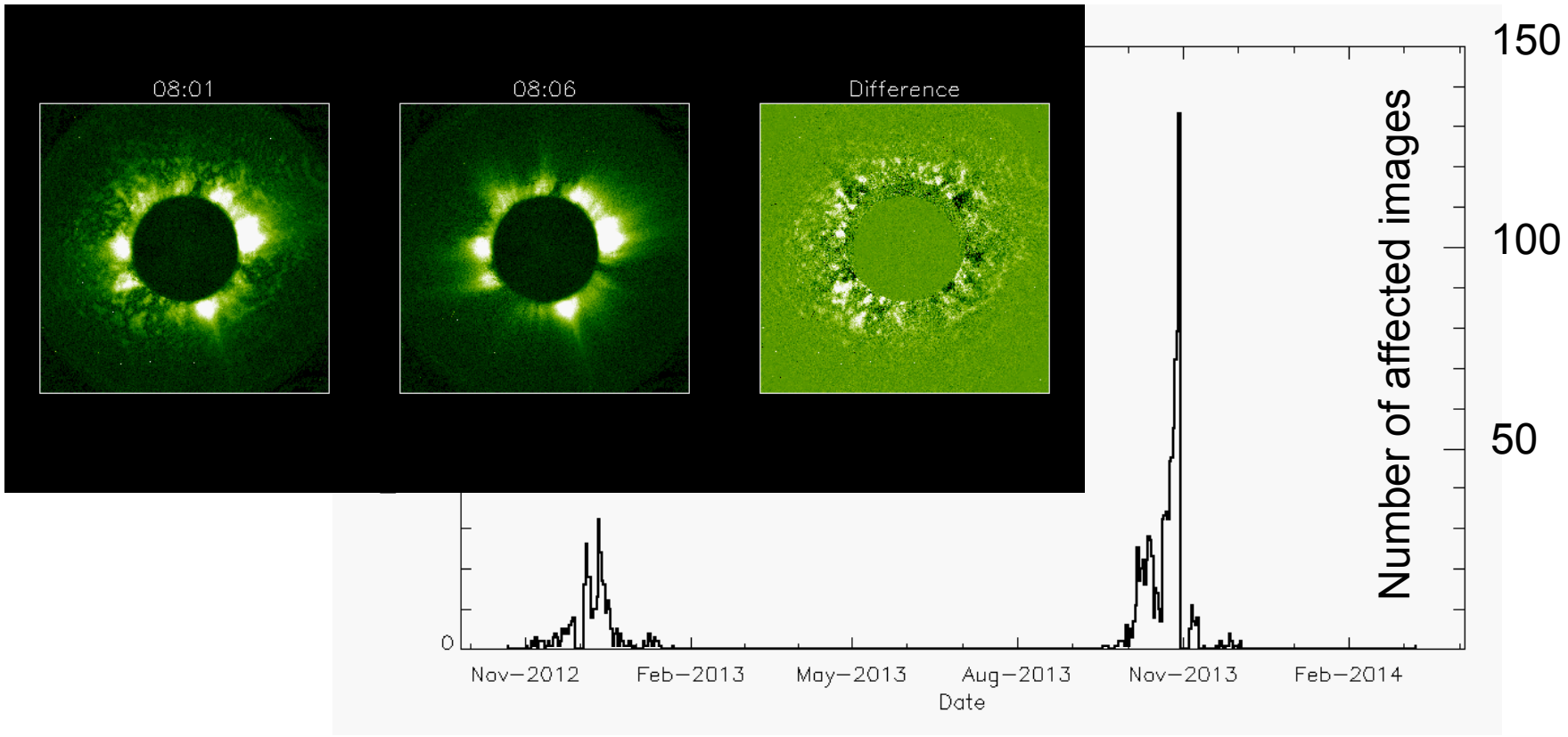
COR1 background evolution

- **No significant new on the COR1 front objective since 2012.**
- **Background increasing on both spacecraft due to thermal bending of the occulter stem.**



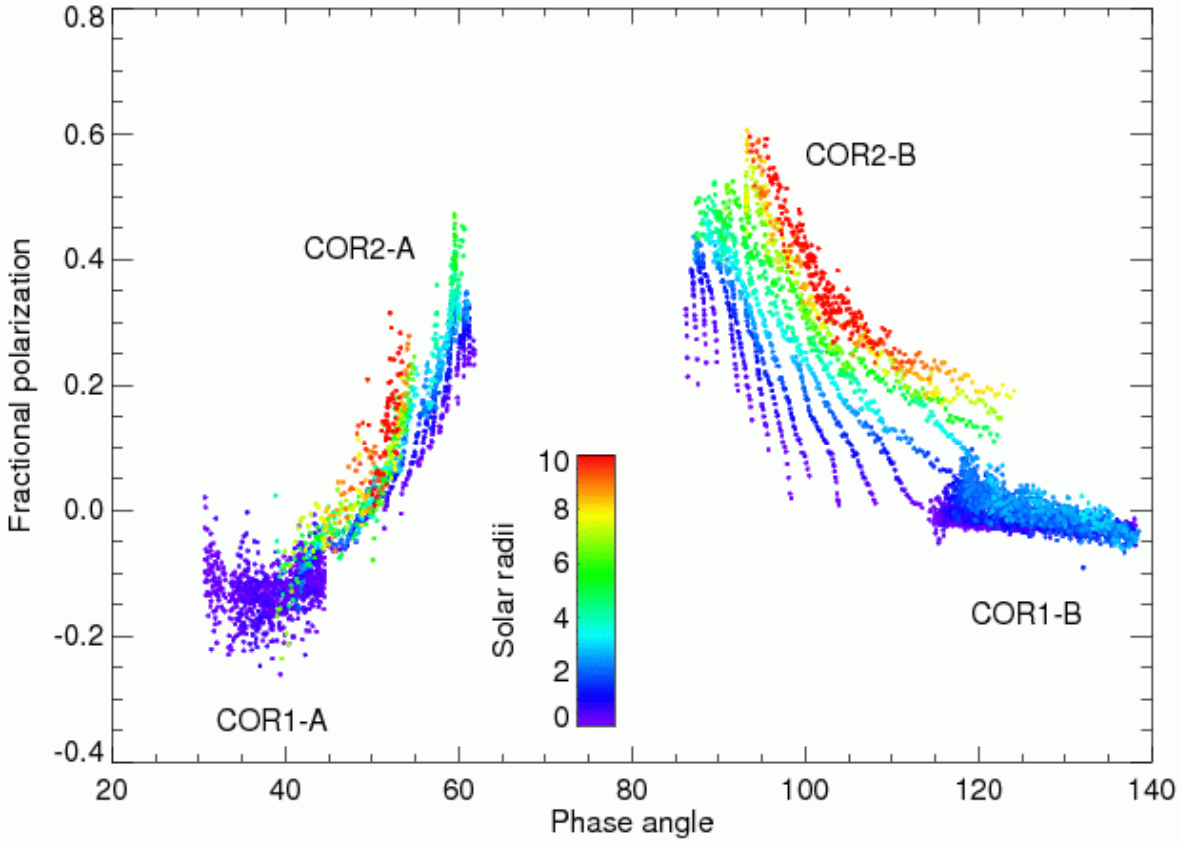
COR1-B polarizer “jitter”

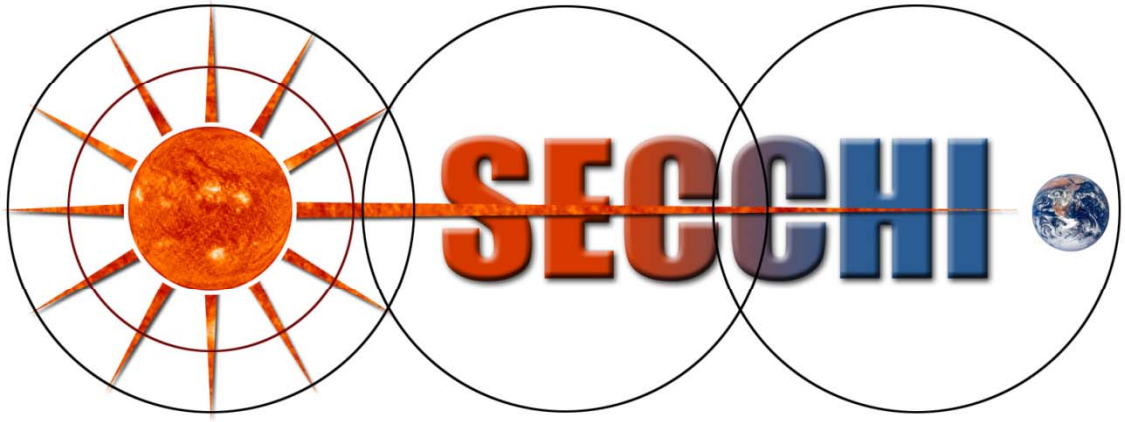
- **A problem developed with COR1-B polarizer mechanism not consistently going to same position when spacecraft near aphelion (i.e. when cold).**
- **In December 2013, solved problem by adjusting mechanism delay setting.**



Comet Lovejoy 2011

- **COR1 and COR2 measured considerable polarization in the dust tail of Comet C/2011 W3 (Lovejoy).**
- **These polarization levels appear to be completely unprecedented, particularly in the negative (radially aligned) polarization branch.**
- **Level of polarization depends not only on the phase angle, but also on the position along the tail.**
- **Polarization properties are related to particle composition.**



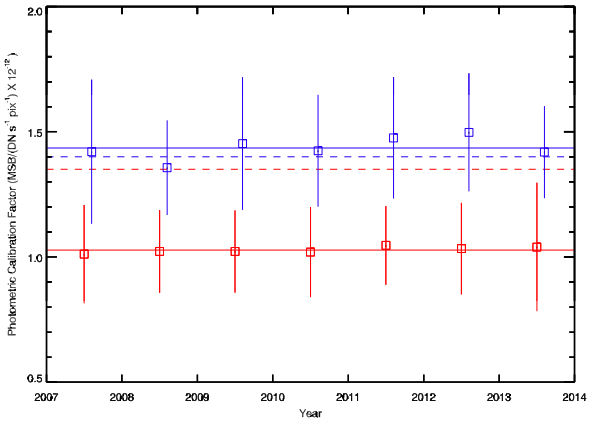


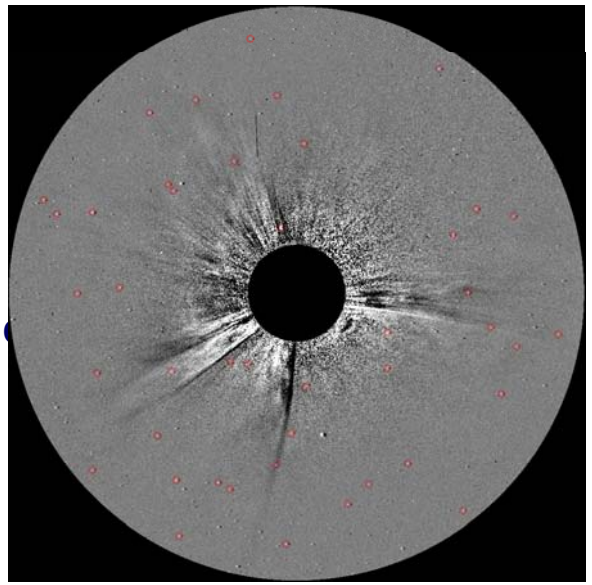
COR2 Status

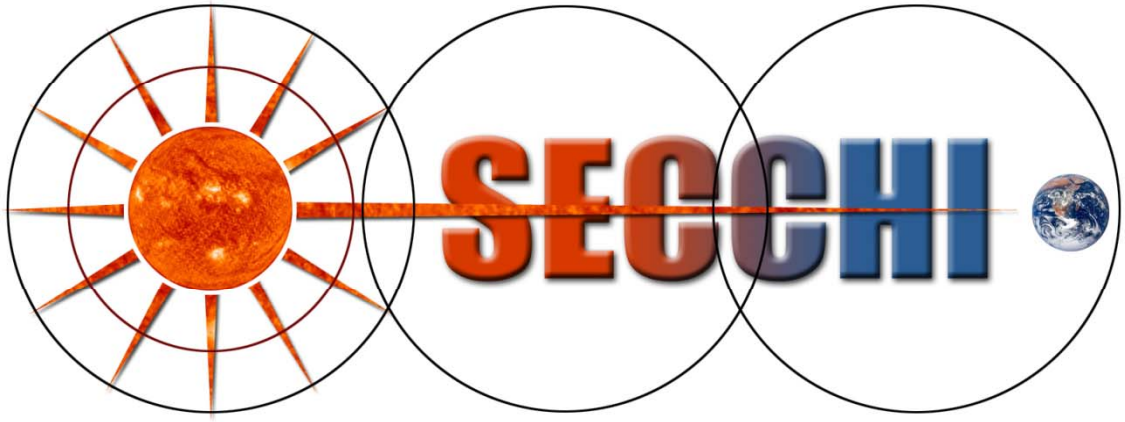
Angelos Vourlidas
Robin Colaninno‼

COR2 Instrument Status

- **Nominal**
  - Synoptic Observing Plan: 3 TB (alternating 1K and 2K), 1 pB (1kx1k) per hour
- **Preliminary In-Flight Calibration**
  - 31% (A) and 2% (B) change from secchi_prep.pro
  - no annual degradation in the observed signal
- **Problems with Preliminary Calibration COR2-B**
  - Slight change in instrument pointing
  - Vignetting function incorrect at outer edge of FOV
- **Calibration Results**
  - Bias : correctly reported, varies with instrument temp.
  - Dark current : ~1 DN across CCD
  - Geometric distortion : within 1 pixel, varies with temp on B
  - Pointing : constant (A), ~1 pixel correction applied with
- **Current Work**
  - Vignetting function – improve with stellar observations







HI-1/2 Status

J.A Davies

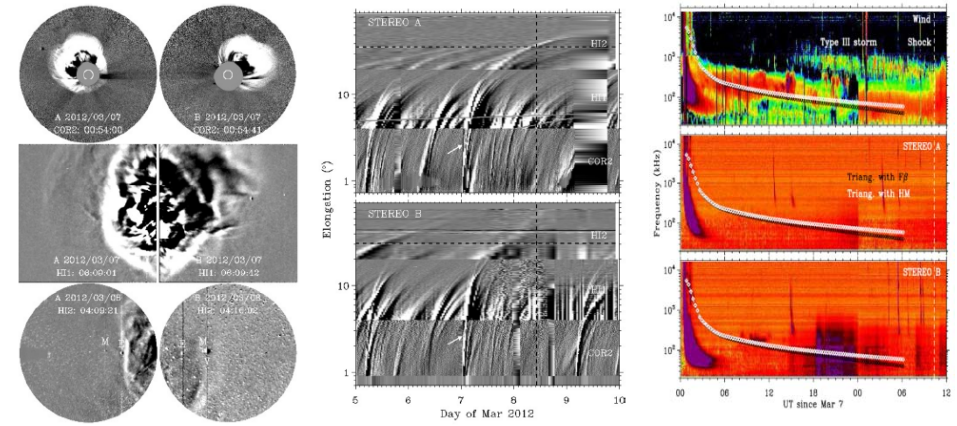
HI instrument/processing status

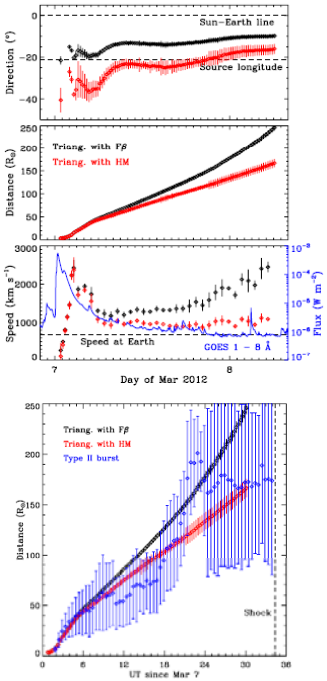
- All four HI cameras still continue to perform well, with no detectable degradation or change in performance (e.g. BenMoussa *et al.* Solar Phys. 288, 2013).
- Despite an overall reduction in mission telemetry, there has been no major impact on HI science.
- Even though the spacecraft are well beyond 'optimum viewing' for Earth-directed events, HI continues to make invaluable observations of Earth-directed CMEs.
- The SolarSoft SECCHI_PREP software has been updated to apply a first-order photometric calibration for HI-2 (the conversion factor between predicted and measured stellar intensity is assumed to be unity). Note conversion to MSB (and S10: see below) now includes the "diffuse" correction accounting for relative pixel solid angle across the entire field of view, for both HI-1 and HI-2.
- The UK Solar System Data Centre (UKSSDC) is providing L1 and L2 data products that are already converted to MSB and S10 (as above). The UKSSDC-provided L2 data is background-subtracted (available with long and short time-scale backgrounds removed). These data are being mirrored by the SSC.

Recent research highlights

- **The STEREO/HI instruments continue to yield exceptional solar wind science (a small AND BIASED selection of which are noted below).**
- **Of significant interest is the use of HI data to study CME-CME interactions, not least resulting from speculation regarding their enhanced geo-effective potential (see Temmer *et al.* ApJ, in press, 2014, and many papers cited within).**
- **Moreover, detailed information regarding the different 'phases' of CME propagation through the heliosphere has also been extracted, by comparing HI imagery to Type II radio burst and in-situ measurements (see Liu *et al.* ApJ, 769, 2013).**
- **Research suggests that the prediction of CME speed and arrival time at Earth could be considerably improved by synoptic use of heliospheric imaging from outside the Sun-Earth line (see Möstl *et al.* ApJ, in press, 2014, and papers within).**
- **Recent work has progressed some of the geometrical modelling techniques that are being used both for science and to make such predictions (e.g. Davies *et al.* ApJ, 750, 2012; ApJ, 777, 2013).**
- **Other STEREO/HI highlights includes the confirmation of the suspected circumsolar dust ring near the orbit of Venus (Jones *et al.* Science, 342, 2013).**

Recent research highlights



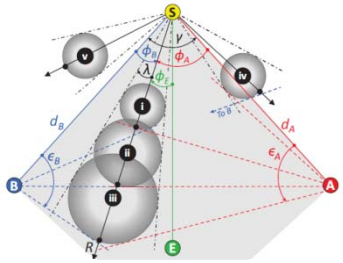


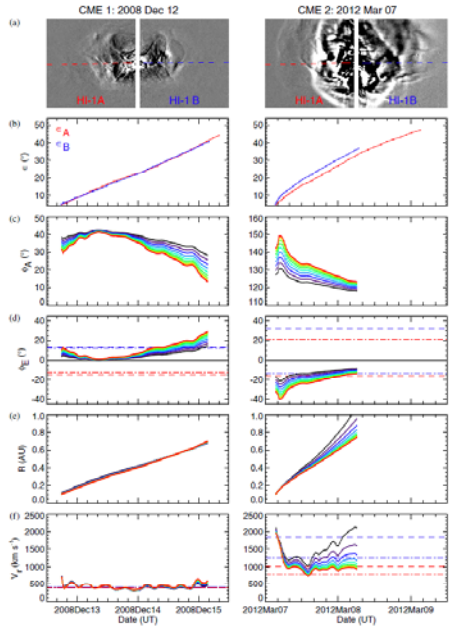
A selection of figures taken from Liu *et al.* (ApJ, 769, 2013), for one of the CMEs studied in that paper.

Above: STEREO/HI and COR2 observations, and radio measurements from STEREO and Wind.

Left: CME kinematic properties, derived from both imaging and radio data.

Figures from Davies *et al.* (ApJ, 777, 2013).





Top left: generalised stereoscopic geometry for which the authors derived expressions for propagation angle, distance and speed as a function of time (SSSE: stereoscopic self-similar expansion technique).

Top right: SSSE technique applied to two Earth-directed CMEs (including that CME studied by Liu et al. presented here).